

NON-PUBLIC?: N
ACCESSION #: 8807120045
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Sequoyah, Unit 2 PAGE: 1 of 6

DOCKET NUMBER: 05000328

TITLE: Reactor Trip On Steam/Feedwater Flow Mismatch Coincident With Low
Steam Generator Level Due To Plugged Sight Glass
EVENT DATE: 05/19/88 LER #: 88-023-01 REPORT DATE: 07/07/88

OPERATING MODE: 1 POWER LEVEL: 072

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(i)

LICENSEE CONTACT FOR THIS LER:

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SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: This LER is being revised to update the corrective action section of this report. On May 19, 1988, with unit 2 at 71.7 percent reactor power, a reactor trip occurred at 1413 EDT. At 1350 EDT, a senior reactor operator (SRO) and an instrument mechanic (IM) started the process of making adjustments to the No. 3 heater drain tank (HDT) level controllers. The SRO and IM proceeded to troubleshoot the problem in an attempt to reduce the level in the subject tank. After three or four manipulations, the SRO noted the HDT pumps began to cavitate, and a subsequent trip of the pumps occurred. At 1405 EDT, the balance of plant (BOP) operator noted fluctuations in the No. 3 HDT discharge flow. At 1408 EDT, both No. 3 HDT pumps tripped. The BOP started a reduction in turbine load. At this time it was noted that steam generator (S/G) No. 1 level was dropping. The operator took manual control of the feedwater regulator valve and went to full open to regain level. Level dropped to 21 percent in the No. 1 S/G before level turned around and started to ascend. The "A" main feedwater pump backed off in speed as it was in the automatic control. However, "B" main feedwater pump continued in manual control causing feedwater flows to be high. Level continued to increase to 60 percent at which point the regulator valves automatically closed as designed. This resulted in a steam/feedwater flow mismatch. The S/G loop 3 low level bistable was already tripped as a result of 2-LT-3-97 being out of service. Therefore, a reactor trip signal was generated due to a steam/feedwater flow mismatch coincident with low S/G

level in loop 3. The mismatch was caused by a S/G level transient induced by a manual BOP runback as a result of No. 3 HDT level manipulation and subsequent loss of the No. 3 HDT pump. The low S/G level was caused by bistable 2-LS-3-97 being in the tripped condition due to environmental qualification concerns. The trip was reviewed with Operations personnel to ensure familiarization with the event and to detail the lessons that could be learned from the transient.

(End of Abstract)

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This LER is being revised to update the corrective action section of this report.

DESCRIPTION OF EVENT

On May 19, 1988, with unit 2 at 71.7 percent reactor power (2235 psig and 566 degrees F), a reactor trip occurred at 1413 EDT. The trip was the result of a steam flow/feedwater flow mismatch coincident with a low steam generator (S/G) level in loop 3.

Prior to the event the following initial conditions existed:

- 1) Control rods were in manual
- 2) "A" main feedwater pump was in automatic
- 3) "B" main feedwater pump was in manual control
- 4) "A" & "B" No. 3 Heater Drain Tank (HDT) operating
- 5) 2AA centrifugal charging pump was inoperable for SI-40.1
- 6) 2BB AFW pump inoperable for SI-298.2
- 7) 2-LT-3-97 (S/G level loop 3) inoperable due to EQ concerns (all bistables tripped)

At approximately 1350 EDT, a senior reactor operator (SRO) and an instrument mechanic (IM) started the process of making adjustments to the No. 3 HDT level controllers. The SRO had been told by the Turbine Building assistant unit operator (AUO) that the No. 3 HDT level was high as noted by visual observation of the sight glass. It was also noted that the controller was set at zero. Using WR B253109, the SRO and IM proceeded to troubleshoot the problem in an attempt to reduce the level in the subject tank. This was being done by a series of small incremental adjustments to the controller followed by checks of the sight glass level, HDT discharge valve position, and HDT pump suction pressure. After the third or fourth such manipulation with no resultant changes in sight glass level, the SRO noted the HDT pumps began to cavitate, and a subsequent trip of the pumps occurred.

At approximately 1405 EDT, the balance of plant (BOP) operator noted

fluctuations in the No. 3 HDT discharge flow and subsequent perturbations in the No. 3 HDT pump amperages. Also, the hotwell level was increasing and flow was oscillating. The operator notified the lead operator and the assistant shift operation supervisor (ASOS). At approximately 1408 EDT, both No. 3 HDT pumps tripped (motor trip out alarm received). The BOP immediately started a reduction in turbine load using the governor valve positioner at the rate of three percent per minute. Recognizing a further reduction was required, the BOP went to valve position limiter control and continued to reduce power. The lead operator had placed the rods in automatic, and the rods stepped in on Tave/Tref mismatch. At this time it was noted that S/G No. 1 level was dropping. The operator took manual control of feedwater regulator valve 2-FCV-3-35 (loop 1) and went to full open to regain level. The operator also opened the bypass regulator valve to 20 percent for additional feedwater flow. Level dropped to 21 percent in the No. 1 S/G before level turned around and started to ascend.

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The "A" main feedwater pump backed off in speed as it was in the automatic control. However, "B" main feedwater pump continued in manual control causing feedwater flows to be high. The operator took manual control of loops 2, 3, and 4 regulator valves and closed down on the valves to reduce feedwater flow to loops 2, 3, and 4. Level continued to increase to 60 percent at which point the regulator valves automatically closed as designed. This resulted in a steam flow/feedwater flow mismatch as the feedwater flow had decreased. Since the S/G loop 3 low level bistable was already tripped as a result of 2-LT-3-97 being out of service, a reactor trip occurred.

The lead operator announced the reactor trip and proceeded to enter E-0, "Reactor Trip or Safety Injection - Units 1 and 2." The ASOS pulled the procedure and had the operators verify the appropriate actions. Following the reactor trip, pressurizer pressure decreased to 1970 psig and pressurizer level decreased to approximately 10 percent. A letdown isolation occurred as a result of the low pressurizer level. The pressurizer pressure and level decrease was due to the cooldown of the reactor coolant system (RCS); however, the RCS and pressurizer cooldown limits specified in TS were not exceeded. Reactor coolant temperature (Tave) in loop 1 decreased to approximately 500 degrees F and to 521 degrees F in the other loops. Loop 1 was lower because the AFW turbine-driven pump was being supplied from this loop. In addition to the reactor trip, the cooldown was exacerbated by steam leaking through the "A" MFPT throttle valve and an intermittent opening of a steam dump valve to the condenser, FCV-1-104. The rod bottom light for shutdown bank "D" rod E-13 did not illuminate; however, the operator verified that the rod position indicator was at zero. It was determined that the rod bottom light had burnt out and that the rod was in the correct position. The light bulb was subsequently replaced. Anomalies noted were:

- 1) The steam dump valve 2-FCV-1-104 intermittently opened without demand.
- 2) The "A" main feedwater pump steam valves leaked through causing approximately 2000 RPM.
- 3) Loop 1 feedwater regulator valve failed to respond in automatic.
- 4) Hotwell level decreased following the trip such that it appeared that the vacuum drag valve from the condensate storage tank was slow or did not respond to the transient.

However, none of the above anomalies affected the response nor the recovery from the reactor trip. Recovery of the trip was initiated using ES-0.1, "Reactor Trip Response, Units 1 & 2."

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CAUSE OF EVENT

The reactor trip was the result of a steam/feedwater flow mismatch coincident with low S/G level in loop 3. The steam/feedwater flow mismatch was caused by a S/G transient induced by a manual BOP runback as a result of No. 3 HDT level controller manipulation and subsequent loss of No. 3 HDT pump. The SRO was manipulating the level controller because the sight glass on the tank was reading high. The sight glass was later found to be plugged and thus giving a false indication. The low S/G level was caused by bistable 2-LS-3-97 being in the tripped condition due to environmental qualification concerns. A splice was found on 2-LT-3-97 which was believed to not be environmentally qualified as required by 10 CFR 50.49. This problem is detailed in LER SQRO-50-328/88022.

ANALYSIS OF EVENT

This report is being submitted under the requirements of 10 CFR 50.73, paragraph a.2.iv, as an event which resulted in the automatic actuation of an engineered safety feature.

The safety-related equipment required to mitigate the transient operated as designed. The SSPS logic was completed with the reactor trip breakers opening and subsequently all rods on the bottom. A feedwater isolation occurred on the reactor trip coincident with a low Tave. Letdown isolated at 17 percent pressurizer level. No PORVs or safety valves lifted. The available AFW pumps started as designed, and the turbine tripped on the reactor trip as required.

Operations personnel performance during the transient demonstrated a thorough knowledge of system performance and the ability to reset and control plant transients.

CORRECTIVE ACTIONS

The following corrective actions were completed before the plant reentered mode 2:

1. The No. 1 regulator valve failed in the as-is position. This valve has been repaired.
2. 2-FCV-1-104 inadvertently opened during the transient. The valve controllers were checked and repaired.
3. 2-LCV-3-97 was repaired with the proper EQ splice.

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The following corrective actions were completed before the plant entered mode 1.

1. The sight glass on the No. 3 HDT was cleaned and verified to be working properly.
2. The controllers on No. 3 HDT were recalibrated.
3. Valves 2-LCV-6-106 A&B and 2-LCV-6-105 A&B have been verified to stroke properly from the controllers.
4. The No. 3 HDT motor trip out light was repaired.
5. Operators and System Engineering were interviewed to determine if any sight glass on feedwater heaters, hotwell, and No. 7 HDT have indications of potential blockage which might result in false level indications. All necessary repairs were accomplished.
6. The vacuum drag valve to the condenser (2-LCV-2-9) was troubleshot and repaired as necessary.

The trip was reviewed with Operations personnel to ensure familiarization with the event and detail the lessons that could be learned from the transient.

Other corrective actions for the event are as follows:

1. Review SQM-2 to determine if further clarification is required for use of generic WRs, such as the one used to manipulate No. 3 HDT level. Revise this procedure if required and provide a SQN dispatch to describe plant policy. This action will be completed by June 20, 1988.

2. Research in-plant versus control room communication for operational necessities/emergencies. Consider dedicated phone line to each horseshoe. This action will be completed by June 30, 1988.
3. Implement a formalized troubleshooting procedure outlining the guidelines on types of troubleshooting allowed and when it is allowed. This action will be completed by July 30, 1988.
4. The main feedwater pump (MFP) high and low pressure stop valves and high pressure governor valves will be repaired, if necessary, before startup following the next unit 2 refueling outage (WR B751430 on the 2A MFP and WR B751429 on 2B MFP).

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COMMITMENTS

1. Review SQM-2 to determine if further clarification is required for use of generic WRs. Revise this procedure if required and provide a SQN dispatch to describe plant policy. This action will be completed by June 20, 1988.
2. Research in-plant versus control room communication for operational necessities/emergencies. Consider dedicated phone line to each horseshoe. This action will be completed by June 30, 1988.
3. Implement a formalized troubleshooting procedure outlining the guidelines on types of troubleshooting allowed and when it is allowed. This action will be completed by July 30, 1988.
4. The main feedwater pump (MFP) high and low pressure stop valves and high pressure governor valves will be repaired, if necessary, before startup following the next unit 2 refueling outage (WR B751430 on the 2A MFP and WR B751429 on 2B MFP).

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ATTACHMENT # 1 TO ANO # 8807120045 PAGE: 1 of 1

TENNESSEE VALLEY AUTHORITY
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July 7, 1988

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Gentlemen:

TENNESSEE VALLEY AUTHORITY - SEQUOYAH NUCLEAR PLANT UNIT 2 -
DOCKET NO.
50-328 - FACILITY OPERATING LICENSE DPR-79 - REPORTABLE
OCCURRENCE REPORT
SQRO-50-328/88023 REVISION 1

The enclosed licensee event report is being revised to update the corrective action section of this report. This event was originally reported in accordance with 10 CFR 50.73, paragraph a.2.iv, on June 16, 1988.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

/s/ S. J. SMITH
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Plant Manager

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